

Evaluating the risk factors of venous thromboembolism patients

Risk factors of venous thromboembolism

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Abstract

Aim: Pulmonary thromboembolism (PTE) is a serious health problem; nevertheless, diagnosing this disorder using today's technology is easier than it was in the past. However, identifying the risk factors associated with PTE and providing proper prophylaxis is as important as diagnosing it. In the present study, it was aimed to identify risk factors for pulmonary embolism and to determine, which patients will should receive special attention for prophylaxis.

Material and Methods: This study included 355 patients with venous thromboembolism. Patient risk factors were evaluated, such as vital signs, laboratory findings, clinical symptoms, diagnosis and treatment methods, mortality rates, Wells scores, and PESI scores were evaluated.

Results: Immobilization was the most common risk factor (42.5%) among the patients. Previous surgery (32 patients, 9%) and cancer (69 patients, 19.4%) were among the most common risk factors. In 44 patients (12.4%), no risk factor was identified. There was a significant correlation between pulmonary arterial pressure and PESI scores, and mortality.

Discussion: In conclusion, it is vital to avoid delays in diagnosing and treating common diseases with high mortality rates, such as VTE and PTE. However, prevention is as important as diagnosis and treatment.

Keywords

Venous Thromboembolism, Risk Factors, Clinical Findings, Mortality

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Introduction

The average incidence rate of venous thromboembolism (VTE) is 23–269/100,000 per year [1–3]. Mortality secondary to VTE has decreased due to the development of early diagnosis and treatment methods, along with the commonplace evaluation of risk factors and correct prophylaxis. Identifying risk factors associated with VTE, as well as an effective and accurate prophylaxis, are as important as the primary treatment of the disease.

Various risk factors have been identified that increase susceptibility to VTE. The most commonly reported risk factors include prior history of VTE, surgery, active cancer, major trauma, hospitalization, long flights, immobility, obesity, and concomitant heart diseases [4–11]. Other risk factors include pregnancy, oral contraceptive use, puerperium, and chronic inflammatory diseases such as inflammatory bowel diseases [12–14].

In addition to environmental and acquired factors causing VTE, hereditary risks also exist. Hereditary conditions causing hypercoagulopathy play an important role in pulmonary thromboembolism's (PTE) pathogenesis. The most common hereditary conditions include protein C deficiency, protein S deficiency, antithrombin-III deficiency, factor-V Leiden mutation, and hyperhomocysteinemia.

This study evaluated the risk factors, epidemiologic characteristics, diagnosis, and treatment methods for patients diagnosed with PTE in our clinic.

Material and Methods

The data of 355 patients with PTE admitted to our hospital were analyzed. The age, gender, comorbid conditions, and risk factors of the patients were evaluated. In addition, data regarding diagnostic test results, post-diagnostic treatments, complications, laboratory results, Wells and PESI scores, and mortality were analyzed. Comparisons between paired independent groups that did not show normal distribution were made using the Mann–Whitney U test. The difference between mortality rates was determined using the ratio test. Data were analyzed using IBM's SPSS 20.0 program. A significance level of $p < 0.05$ was considered statistically significant.

Statistical Method

Data were analyzed in IBM SPSS 20.0. Comparisons of two independent groups that did not show normal distribution were tested with the Mann-Whitney U test. The difference between mortality rates was tested with the ratio test. A p -value < 0.05 was considered statistically significant.

Ethical Approval

Every stage of the study was carried out in accordance with ethical principles. Ethical approval was obtained from the ethics committee (Date: 2021-19-08, No: 2021-147).

Results

Among the 355 patients included in the study, 241 (60.3%) were female, and 141 (30.7%) were male. The average age of the patients was 70 years. When the vital signs of the patients were analyzed, it was found that the mean respiratory rate of the patients was 23 (\pm 5), the mean systolic blood pressure was 117 (\pm 22) mmHg, the mean diastolic blood pressure was

70 (\pm 12) mmHg, the mean pulse rate was 97 (\pm 17) bpm, and the mean temperature was 36.7 °C.

The patients' mean arterial blood gas values were 72.4 mmHg for PO₂, 33.1 mmHg for PCO₂, a pH of 7.4, and 91.4% saturation. Dyspnea was the most common complaint (91.5%) during hospitalization. Other symptoms and complaints recorded while the patients were hospitalized are presented in Table 1. Exactly 58 (16.1%) of the patients were smokers.

No risk factors were detected in 44 patients (12.4%). The most common risk factor was immobilization. The patients' risk factors are shown in Table 2.

Precisely 24 patients (6.8%) had a low Wells score, 228 patients (64.2%) had a moderate Wells score, and 103 patients (29%) had a high Wells score. Exactly 260 patients (73.2%) were found to have PESI scores indicating high risk. There was a significant correlation between PESI scores and mortality.

Thoracic CT angiography was the most commonly used diagnosis method. Exactly 338 (95.2%) patients were diagnosed with thoracic CT angiography. Apart from CT angiography, ten patients were diagnosed using scintigraphy, three were diagnosed by clinical examination, and four by Doppler USG. Tomography results indicated thrombus in the main pulmonary artery in 125 patients (36.9%), thrombus in the lobar vessels in 203 patients (59.9%), segmental thrombus in 251 patients (74.4%), and subsegmental thrombus in 147 patients (43.5%). The most common radiologic finding besides pulmonary embolism was atelectasis (109, 32.3%). Other concomitant findings were pleurisy, diaphragmatic elevation, mosaic perfusion, consolidation, and pulmonary infarction. Deep

Table 1. Symptoms and complaints of patients diagnosed with pulmonary thromboembolism.

Signs and symptoms	Number (n) (%)
Chest pain	99 (27.5)
Dyspnea	325 (91.5)
Hemoptysis	15 (4.2)
Syncope	31 (8.7)
Altered consciousness	53 (14.9)
Swelling in legs	85 (23.9)
Fever	13 (3.7)
Flank pain	27 (3.6)

Table 2. Risk factors of patients with pulmonary thromboembolism.

Risk factors	Number (n) (%)
No risk	44 (12.4)
Immobilization (for more than 3 days)	151 (41.5)
Surgery (in the last 1 month)	32 (9)
Cancer	69 (19.4)
History of thrombosis	27 (7.6)
Hereditary	1 (0.3)
Cerebrovascular Diseases	2 (0.6)
Pregnancy	1 (0.3)
Travel	5 (1.4)
Chronic heart/lung diseases	23 (6.5)

vein thrombosis was detected in 133 (45.5%) patients who underwent lower extremity venous Doppler. Echocardiographic examination showed right ventricular dysfunction in 154 (43.4%) patients. The mean pulmonary artery pressure of the patients was 40 mmHg.

Patients diagnosed with PTE received standard heparin (72, 20.3%), low molecular weight heparin (242, 68%), thrombolytic therapy (36, 10.1%), and vena cava inferior filter (5, 1.4%) as initial treatment methods. Major bleeding was observed in seven patients (2%) after being administered thrombolytics. Fifteen (7.1%) of the patients expired, mainly due to PTE, while other patients succumbed to myocardial infarction, malignant diseases, cerebrovascular diseases, sepsis, or heart failure. The hospital mortality rate was 10.4%.

Discussion

If not promptly diagnosed and treated, VTE is a common disease with high mortality and morbidity. Prevention of this disease is as important as timely diagnosis. Understanding the risk factors of VTE and applying appropriate prophylaxis can help prevent the occurrence of the disease and, thus, its mortality and morbidity. There are different risk factors for PTE, and scoring systems based on these factors help doctors diagnose VTE. The Wells Criteria, Modified Wells Criteria, Geneva Score, and Modified Geneva Score are the most commonly used scoring systems for diagnosing VTE [15]. Due to its specific parameters, the Wells Criteria, an empirical probability scoring system, is the easiest to apply in clinical practice. In this study, 64.2% of the patients were found to have a moderate probability of embolism.

The current study analyzed the data and risk factors of PTE patients admitted to our clinic. The mean age of the patients in this study (70) was roughly middle-aged, similar to previous studies [16]. However, compared to other studies, the mean age of the patients was higher. In previous studies, the risk of thrombosis was shown to increase with age. The results of the present study also supported this finding [17,-18].

While risk factors for PTE are examined by considering genetic and acquired factors, the causative factor is not determined in half of all cases [19]. However, in this study, the number of cases where no risk factor could be detected (12.4%) was lower than in prior studies. Acquired risk factors for PTE include prolonged immobilization, a recent operation or trauma, and a history of thrombophlebitis. Similar to previous studies, immobilization was found to be the most common risk factor in the current study [20].

The most common clinical manifestations of PTE include acute onset dyspnea, chest pain, tachypnea, and tachycardia. However, these symptoms are not specific to pulmonary embolism. Similar to the literature, the most common symptoms in this study were acute onset dyspnea (91.5%) and chest pain (27.5%).

As prior studies have shown, patients with PTE may have lung radiograph results that do not indicate PTE. PTE's The most common lung radiograph indicators of PTE are linear atelectasis, diaphragmatic elevation, pleural effusion, and parenchymal infiltration [21]. In this study, the most common direct radiographic finding was linear atelectasis, with a rate of 32.3%. Other common findings were diaphragmatic elevation

and infiltration. One of the most commonly used methods in diagnosing PTE is thoracic CT angiography. Prior studies have reported widely varying sensitivity and specificity values for thoracic CT angiography in diagnosing PTE. This wide range of sensitivity and specificity is believed to be related to the experience of the individual taking and interpreting the images. Thoracic CT angiography was performed in 95.2% of our patients, and filling defects were most commonly observed in the segmentary arteries (74.4%). The main pulmonary artery thrombi rate was 36.6% in this study, and, in correlation, right ventricular dysfunction was observed in the echocardiographic examination results of 43.4% of the patients. Mean pulmonary artery pressure (PAB) was measured as 40 mmHg. There was a significant correlation between PAB and mortality. Median PAB values were found to be higher in patients who eventually expired.

Different from other studies conducted on VTE risk factors, the treatment methods applied to the patients were examined in the current study. DMWH treatment was found to be the most common initial treatment. Current guidelines and prior studies similarly recommend standard heparin or DMWH as a treatment for PTE. In addition, 10% of the patients were given thrombolytic therapy. Precisely 7.1% of the patients diagnosed with thromboembolism lost their lives due to PTE. When considered together, these data points clearly show the importance of reperfusion therapy in treating PTE. The PESI index predicts mortality due to PTE and determines its severity. The PESI index scores of the study's patients participating in the study were also evaluated. As a result, 260 patients (73.2%) were found to have PESI scores indicating high risk. There was a significant correlation between PESI scores and mortality. Patients with high PESI scores had a significantly increased mortality rate.

Conclusion

It is vital to avoid delays in diagnosing and treating common diseases with high mortality rates, such as VTE and PTE. However, prevention is as important as diagnosis and treatment. To prevent such diseases, it is necessary to identify risk factors and apply the proper prophylaxis. This study examined these risk factors, their frequencies, and diagnosis and treatment methods.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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